

Original Research Article

<https://doi.org/10.20546/ijcmas.2018.708.175>

## Screening of Brinjal Germplasm against Wilt Complex Disease

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### ABSTRACT

#### Keywords

Brinjal, Germplasm, Screening, Soil borne pathogens, Wilt complex

#### Article Info

##### Accepted:

10 July 2018

##### Available Online:

10 August 2018

Thirty germplasm of Brinjal (*Solanum melongena* L.) were screened against wilt complex pathogens viz., *Fusarium oxysporum* f.sp. *melongenae*, *Rhizoctonia solani* and *Sclerotium rolfsii* under field and pot experiments. Germplasm (30) that were found to be resistant varieties were Pusa Purple cluster, Swaran Shamli, Arka Sheel in both the pot and field experiment against wilt complex. The germplasm that were found to be resistant against wilt complex were Pusa Purple Round, Pusa Purple Cluster, Swaran Shamli, Arka Nidhi, Banaras Giant and Arka Neelkanth under field conditions. However in pot conditions, Pusa Purple Cluster, Arka Nidhi, Swaran Shamli, Banaras Giant and Arka Neelkanth were categorized as resistant varieties

### Introduction

Brinjal or eggplant (*Solanum melongena* L.) is a member of solanaceae family and a common vegetable crop grown all over the world. India is considered to be the centre of its origin (Zeven and Zhukovsky, 1975) and many varieties of brinjal, varying in shape, size and colour of the fruit are grown here. India is the second largest producer of brinjal in the world next to China (Anonymous, 2009). The global area under brinjal cultivation during the year 2015-16 has been estimated at 663 million

hectare with production of about 12515 million tonnes (Anonymous, 2016). Brinjal cultivation in India is estimated to cover about 8.14 per cent vegetable area with a contribution of nine per cent to total vegetable production. Jammu and Kashmir accounts for an area of 2.0 thousand hectare with a production of 45.24 thousand tones.

Cultivation of resistant genotypes is the best method of managing the disease. Besides resistance to soil borne pathogens, these lines could be used for hybridization programme to

evolve cultivars possessing desirable traits As brinjal is susceptible to several diseases such as damping off, wilt, root rot, collar rot, etc. the development of resistant varieties is a major challenge of which *Fusarium oxysporum* f. sp. *melongenae*, *Rhizoctonia solani*, *Sclerotium rofsii*, are the most common. So, use of synthetic chemicals probably can kill the beneficial soil microflora.

Therefore, resistant varieties of crop plants will result to escape such diseases. The present investigations were undertaken to screen out the available germplasm of brinjal against wilt complex diseases in field and pot conditions.

### **Materials and Methods**

The experiment was laid in Randomized Block Design with three replications, during 2014 and 2015, to evaluate thirty lines under field conditions. Another set of experiment with the select germplasm was laid in pots under glasshouse conditions.

Healthy brinjal seeds of susceptible brinjal cultivar Pusa Purple Long (PPL) were sown in 2×3 meter plots for raising nursery. One-month-old seedlings were transplanted to main field in plots with the spacing of 60×45 cm, in four rows of four plants each. Each plot was separated by a row of susceptible brinjal variety PPL, to ensure the availability of adequate inoculum for the development of infection.

To evaluate the germplasm under glasshouse conditions, *Fusarium oxysporum* f. sp. *melongenae*, *Rhizoctonia solani* and *Sclerotium rofsii*, mass multiplied on sterilize sorghum grains, were added to the pots, each @ 5g/kg of soil. Potted soil were mixed with FYM in 2:1 ratio and sterilized with 5 per cent formalin by thoroughly mixing and then covering it with a polyethylene sheet for 72

hours. Later it was spread for 48 hours to release formalin fumes. One brinjal plant per pot was maintained. All the agronomic practices were followed as per the SKUAST-Jammu package of practices.

The data was recorded at 30, 45 and 60 days after inoculation (DAI) and per cent disease incidence was calculated as mentioned earlier (3.1). The reaction of each genotype was categorized on the basis of per cent disease incidence. The disease reaction was calculated as per the scale suggested by Mew and Ho (1976).

### **Disease reaction: Wilt incidence**

Resistant (R): < 20 % wilting

Moderately resistant (MR): 20 to 40% wilting

Moderately Susceptible (MS): 41 to 60% wilting

Susceptible: > 60% wilting

### **Results and Discussion**

Germplasm obtained from different sources were evaluated against the soil borne pathogens of brinjal viz., *F. oxysporum* f. sp. *melongenae*, *R. solani* and *S. rofsii* (during the year 2014 and 2015) (Table 1). The pooled data presented in the Table reveal that under field conditions, the minimum (7.78%) wilt complex was recorded in Arka Nidhi. It was followed by Arka Neelkanth, Pusa Purple Cluster, Swaran Shamli, Banaras Giantand Pusa Purple Round, in which wilt complex recorded was 9.25, 9.60, 12.50, 12.50 and 15.00 per cent, respectively. However, the germplasm, Pusa Hybrid-13, Shamli, Unnati, Pusa Hybrid-5, Nisha Improved, Punjab Sadabahar, Navkiran, Pusa Hybrid-6, Brinjal Round and Pant Rituraj recorded wilt complex of 44.20, 45.60, 45.80, 46.00, 51.00, 52.00,

53.00, 54.20, 54.20 and 55.20 per cent, respectively. The germplasm viz., Black Beauty, Kokila, Daksh, Azad Kranti, Pant Samrat, Punjab Barsati, Krishna, Mahadeva, Manisha, Utsav and Pusa Purple Long resulted in 60.50, 60.50, 60.50, 60.80, 61.70, 62.50, 62.50, 62.70, 64.60, 66.50 and 68.45 per cent wilt complex, respectively.

Regarding the disease reaction on different germplasms, the Table 1 further reveal that under field conditions, the germplasm that could be categorised as resistant were Pusa Purple Round, Pusa Purple Cluster, Swaran Shamli, Arka Nidhi, Banaras Giant and Arka Neelkanth, where the wilt incidence ranged from 0.00 to 20.00 per cent.

However, Pusa Kranti, Green Long and Brinjal Hybrid Gole exhibited wilt incidence ranging from 21.00 to 40.00 per cent, therefore were categorised as moderately resistant. Nisha Improved, Pusa Hybrid-6, Shamli, Punjab Sadabahar, Brinjal Round, Pusa Hybrid-13 and Unnati were categorized as moderately susceptible, as they recorded wilt incidence ranging from 40.00 to 60.00 per cent.

Pusa Purple Long, Navkiran, Pant Samrat, Kokila, Pant Rituraj, Manisha, Daksh, Utsav, Mahadeva, Punjab Barsati, Black Beauty, Krishna and Azad Kranti were categorized as susceptible as they exhibited the wilt incidence of more than 60 per cent. The consolidated categorization of the germplasm as per the disease reaction has been presented in Table 16.

During the year 2014 and 2015, the pot experiment was also conducted to screen the obtained germplasm lines of brinjal and the pooled data presented in Table 1 reveal that minimum wilt complex was recorded in case of germplasm Arka Nidhi (13.00%). The germplasms viz., Pusa Purple Cluster, Arka

Neelkanth, Swaran Shamli and Banaras Giant recorded 13.60, 16.20, 17.75 and 17.75 per cent, wilt complex, respectively. Whereas, the germplasms Pusa Purple Round and Pusa Kranti recorded 27.80 and 39.00 per cent, wilt complex, respectively.

However, the germplasm viz., Green long, Brinjal Hybrid Gole, Pusa Hybrid-5, Pusa Hybrid-13, Unnati, Nisha Improved, Shamli, Pusa Hybrid-6 and Punjab Sadabahar recorded wilt complex of 43.80, 49.60, 52.00, 52.50, 54.17, 55.80, 56.90, 57.50 and 57.20 per cent, respectively.

The germplasm viz., Pant Rituraj, Brinjal Round, Navkiran, Mahadeva, Pant Samrat, Krishna, Punjab Barsati, Kokila, Azad Kranti, Black Beauty, Daksh, Manisha, Utsav and Pusa Purple Long exhibited 60.30, 60.80, 64.60, 64.70, 65.00, 65.80, 65.83, 66.33, 67.00, 67.33, 67.50, 68.25, 72.50, 73.50 and 77.50 per cent wilt complex, respectively.

Under pot conditions, Pusa Purple Cluster, Arka Nidhi, Swaran Shamli, Banaras Giant and Arka Neelkanth were categorised as resistant, as the wilt incidence recorded in them ranged from 0.00 to 20.00 per cent.

Pusa Kranti and Pusa Purple Round were categorised as moderately resistant with wilt incidence from 20.00 to 40.00 per cent. Nisha Improved, Pusa Hybrid-5, Pusa Hybrid-6, Punjab Sadabahar, Shamli, Green long, Brinjal Hybrid Gole and Unnati recorded incidence ranging from 41.00 to 60.00 per cent, hence were categorized as moderately susceptible.

Pusa Purple Long, Navkiran, Pant Samrat, Pant Rituraj, Brinjal Round, Kokila, Manisha, Daksh, Utsav, Mahadeva, Uttara, Azad Kranti, Krishna, Punjab Barsati and Black Beauty were categorized as susceptible, as they showed wilt incidence of more than 61.00 per cent. The data is also presented in Table 2

**Table.1** Evaluation of brinjal germplasm against wilt complex under field and pot experiments

Germplasm	Wilt Incidence (%)							
	Under Field conditions				Under Pot experiment			
	2014	2015	Pooled	Disease Reaction	2014	2015	Pooled	Disease Reaction
Pusa Purple Long	68.90	68.00	68.45	S	80.00	75.00	77.50	S
Pusa Hybrid -5	48.00	44.00	46.00	MS	54.00	50.00	52.00	MS
Pusa Kranti	30.00	26.00	28.00	MR	40.00	38.00	39.00	MR
Kokila	60.00	61.00	60.50	S	68.00	66.00	67.00	S
Navkiran	54.00	52.00	53.00	MS	66.00	63.33	64.70	S
Manisha	66.67	62.50	64.60	S	75.00	70.00	72.50	S
Daksh	61.00	60.00	60.50	S	68.00	68.50	68.25	S
Utsav	68.00	66.67	67.33	S	75.00	72.00	73.50	S
Mahadeva	62.00	63.33	62.70	S	65.00	65.00	65.00	S
Arka Nidhi	6.67	8.89	7.78	R	14.00	12.00	13.00	R
Azad Kranti	61.67	60.00	60.80	S	66.67	68.00	67.33	S
Punjab Sadabahar	50.00	54.00	52.00	MS	56.00	58.33	57.20	MS
Shamli	46.67	44.44	45.60	MS	58.33	55.55	56.90	MS
Krishna	60.00	58.33	60.50	S	66.67	65.00	65.83	S
Pant Samrat	63.33	60.00	61.70	S	65.00	66.67	65.80	S
Pant Rituraj	56.00	54.44	55.20	S	62.50	58.00	60.30	S
Brinjal Round	56.67	51.67	54.20	MS	61.67	60.00	60.80	S
Nisha Improved	50.00	52.00	51.00	MS	55.00	56.67	55.80	MS
Pusa Hybrid- 6	51.67	56.67	54.20	MS	56.67	58.33	57.50	MS
Pusa Purple cluster	9.00	10.12	9.60	R	12.12	15.00	13.60	R
Swaran Shamli	11.67	13.33	12.50	R	18.00	17.50	17.75	R
Pusa Purple Round	18.33	11.67	15.00	R	28.33	27.27	27.80	MR
Green Long	31.67	35.00	33.30	MR	42.00	45.50	43.80	MS
Brinjal Hybrid Gole	37.50	35.00	36.25	MR	44.17	55.00	49.60	MS
Pusa Hybrid-13	45.00	43.33	44.20	MS	51.67	53.33	52.50	MS
Unnati	50.00	41.67	45.80	MS	58.33	50.00	54.17	MS
Punjab Barsati	61.67	63.33	62.50	S	66.67	66.00	66.33	S
Banaras Giant	11.67	13.33	12.50	R	18.00	17.50	17.75	R
Black Beauty	60.00	61.00	60.50	S	67.00	68.00	67.50	S
Arka Neelkanth	10.50	8.00	9.25	R	18.52	13.79	16.20	R

**Table.2** Reaction of brinjal germplasm against wilt complex disease under field and pot experiment

Rating	Disease incidence	Field conditions	Pot experiment
Resistant	< 20 %	Arka Nidhi, Pusa Purple Cluster, Swaran Shamli, Pusa Purple Round, Banaras Giant and Arka Neelkanth	Arka Nidhi, Pusa Purple Cluster, Swaran Shamli, Banaras Giant and Arka Neelkanth
Moderately resistant	> 20- 40 %	Pusa Kranti, Green Long and Brinjal Hybrid Gole	Pusa Kranti and Pusa Purple Round
Moderately susceptible	>40-60 %	Pusa Hybrid-5, Navkiran, Punjab Sadabahar, Shamli, Brinjal Round, Nisha Improved, Pusa Hybrid- 6, Pusa Hybrid-13 and Unnati	PusaHybrid-5,Punjab Sadabahar, Shamli, Nisha Improved, Pusa Hybrid-6, Green long, Pusa Hybrid- 13 Brinjal Hybrid Gole and Unnati
Susceptible	> 60%	Pusa Purple Long, Kokila, Manisha, Daksh, Utsav, Mahadeva, Azad Kranti, Krishna, Pant Samrat, Pant Rituraj, Punjab Barsati and Black Beauty	Pusa Purple Long, Kokila, Navkiran, Manisha, Daksh, Utsav, Mahadeva, Azad Kranti, Krishna, Pant Samrat, Pant Rituraj, Brinjal Round, Punjab Barsati and Black Beauty

### Source of Germplasm

Germplasm	Source
Pusa Purple Long, Pusa hybrid-5, Pusa Hybrid- 6, Pusa Hybrid 13, Pusa Kranti, Brinjal Hybrid Gole, Navkiran	National seed corporation Ltd., Pusa complex, New Delhi.
Nisha Improved, Kokila, Green Long, Manisha, Daksh, Utsav, Mahadeva, Unnati,	Century (Century seeds Pvt. Ltd.) Mangolpuri Industrial Area, New Delhi
Arka Nidhi, Swaran Shamli, Pusa Purple Round, Pusa Purple Cluster, Punjab Sadabahar, Pant Rituraj, Pant Samrat, Brinjal Round, Shamli, Arka Neelkanth, Punjab Sadabahar, Black Beauty, Uttara	Division of Olericulture and Floriculture, SKUAST- Jammu, Chatha, Jammu and Kashmir
Krishna, Brinjal Round,	Nuziveedu Seeds Limited, Connought Place, New Delhi.

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Sheel in both the pot and field experiment against wilt complex. Besides resistance to soil borne pathogens, these lines could be used for hybridization programme to evolve

cultivars possessing desirable traits. Mukherjee and Mukhopadhyay (1982) reported Pusa Purpe Long cultivar as most resistant and Pusa Kranti as moderately resistant against *R. solanacearum*. Pathania *et al.*, (1996) reported that Arka Neelkanth and Arka Keshav were immune, whereas, Pant Rituraj, Pant Samrat and Pusa Purple Long were highly susceptible against *R. solanacearum*. Haider *et al.*, (2001) evaluated brinjal germplasms against *M. incognita* and categorized Azad Kranti, Banaras Giant and Pant Rituraj as moderately resistance and Pusa Purple Long as susceptible cultivars.

The disease reaction (Mew and Ho, 1976):

Resistant(R): <20% wilting

Moderately Resistant (MR): 20 - 40 % wilting

Moderately Susceptible (MS): 41 - 60 % wilting

Susceptible (S): > 60% wilting

### **Acknowledgement**

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### **How to cite this article:**

Richa Sharma, V.K. Razdan, Stanzin Dorjey, Prerna Gupta and Seethiya Mahajan. 2018. Screening of Brinjal Germplasm against Wilt Complex Disease. *Int.J.Curr.Microbiol.App.Sci* 7(08): 1534-1539. doi: <https://doi.org/10.20546/ijcmas.2018.708.175>